**CLAIMS**

What is claimed is:

1. A tuning and isolating support device for a tunable fiber optic component comprising:

a) a fiber optic tensioning structure having at least opposing ends configured to rigidly attach to and along a common longitudinal axis with the tunable fiber optical component and formed of an electrically-active, mechanically-responsive material such that changes in dimension along the longitudinal axis arising from an applied voltage to the tensioning structure yield corresponding dimensional changes in the fiber optic component to provide tunable adjustment of an optical frequency of the fiber optic component; and

b) an acoustic damping material encasing at least a portion of the tensioning structure and configured to minimize environmental vibration effects on the fiber optic component.

2. The tuning and isolating support device of claim 1, wherein the tensioning structure is fabricated from a piezoelectric material.

3. The tuning and isolating support device of claim 1, wherein the tensioning structure comprises at least one section of a piezoelectric material and at least one section of a rigid material.

4. The tuning and isolating support device of claim 1, wherein the tensioning structure further comprises a longitudinal bore configured to receive the fiber optic component.

5. The tuning and isolating support device of claim 4, further comprising acoustic damping material disposed within the bore.

6. The tuning and isolating support device of claim 4, wherein the tensioning structure further comprises at least one radially disposed aperture connecting the bore to an outer surface of the tensioning structure.

7. The tuning and isolating support device of claim 4, further comprising:

a) an inner electrode located on an inner surface of the fiber optic tensioning structure; and

b) an outer electrode located on an outer surface of the fiber optic tensioning structure where the inner and outer electrodes are configured to apply an electrical potential radially to the fiber optic tensioning structure.

8. The tuning and isolating support device of claim 7, wherein the outer electrode is split into two sections and the inner electrode is connected to one of the sections to provide an external electrical connection to the inner electrode.

9. The tuning and isolating support device of claim 7, further comprising an electrically conductive plug positioned within the end of the bore and providing electrical contact to the inner electrode of the tensioning structure.

10. The tuning and isolating support device of claim 7, further comprising an electrically conductive plug positioned within the end of the bore and providing electrical contact to the outer electrode of the tensioning structure.

11. The tuning and isolating support device of claim 7, further comprising an electrical lead longitudinally disposed within the bore and in electrical contact with the inner electrode.

12. The tuning and isolating support device of claim 11, further comprising a conductive adhesive disposed within the bore and providing electrical connection between the electrical lead and the inner electrode.

13. The tuning and isolating support device of claim 4, further comprising a plug positioned within the end of the tensioning structure and having a hole configured to receive and rigidly attach to the fiber optic component.

14. The tuning and isolating support device of claim 1, further comprising the tunable fiber optic component longitudinally mounted and rigidly attached to the tensioning structure.

15. The tuning and isolating support device of claim 14, wherein the fiber optic component comprises a conductive jacket used to provide electrical connection to the tensioning structure.

16. The tuning and isolating support device of claim 14, wherein the fiber optic component is rigidly attached to the tensioning structure with glue.

17. The tuning and isolating support device of claim 14, wherein the fiber optic component is rigidly attached to the tensioning structure with clamps.

18. The tuning and isolating support device of claim 14, wherein the fiber optic component is configured as a distributed feedback fiber laser mounted with an active region of the distributed feedback fiber laser positioned substantially between the ends of the tensioning structure.

19. The tuning and isolating support device of claim 18 wherein the distributed feedback fiber laser length is optimally selected to provide a particular mechanical natural frequency and optical linewidth.

20. A tuning and isolating support device for a tunable fiber optic component comprising:

a) a thermally conductive, acoustic damping material configured to define an enclosure volume to receive the tunable fiber optic component and configured to minimize environmental vibration effects on the fiber optic component; and

b) a thermal control device in thermal contact with the thermally conductive acoustic damping material, wherein the thermal control structure varies in temperature in response to an applied electrical signal and controls a temperature of the fiber optic component so that the fiber optic component optical frequency is tuned in response to the applied electrical signal.

21. The tuning and isolating support device of claim 20, wherein the thermal control device comprises a resistive heater wire embedded within the thermally conductive, acoustic damping material.

22. The tuning and isolating support device of claim 20, wherein the thermal control device comprises a thermally controlled surface.

23. The tuning and isolating support device of claim 20, wherein the thermally controlled surface is selected from the group consisting of thermoelectric cooler, heat pump, and heat exchanger.

24. The tuning and isolating support device of claim 20, further comprising the tunable fiber optic component longitudinally mounted and rigidly attached to the tensioning structure.

25. A tuning and isolating support device for a tunable fiber optic component, comprising:

a) a fiber optic tensioning structure having at least opposing ends configured to rigidly attach to and along a common longitudinal axis with the tunable fiber optic component and formed of an electrically active, mechanically responsive material such that changes in dimension along the longitudinal axis arising from a first applied voltage to the tensioning structure yield corresponding dimensional changes in the fiber optic component to provide tunable adjustment of an optical frequency of the fiber optic component; and

b) a thermal control structure coupled to the tensioning structure to control temperature of the fiber optic component and provide changes in the optical frequency by adjustment of the temperature, said thermal control structure including:

(i) a thermally conductive, acoustic damping material configured to minimize environmental vibration effects on the fiber optic component; and

(ii) a thermally controlled surface in thermal contact with the thermally conductive acoustic damping material, wherein the thermally controlled surface varies in temperature and controls the temperature of the fiber optic component so that the fiber optic component optical frequency is tuned at least partially in response to the second applied voltage.

26. The tuning and isolating support device of claim 25, further comprising the tunable fiber optic component longitudinally mounted and rigidly attached to the tensioning structure.

27. A method of tuning the optical frequency of a fiber optic component with a fine tuning range as well as a coarse tuning range comprising the steps of:

a) varying temperature of the fiber optic component, while

b) substantially simultaneously applying variable mechanical strain to the fiber optic component.

28. A method of compensating for variations in an optical system including a fiber optic component comprising:

a) operating the fiber optic component;

b) varying temperature of the fiber optic component to change optical frequency of the fiber optic component to compensate for slowly changing variations in the optical system; and

c) varying mechanical strain of the fiber optic component to change the optical frequency of the fiber optic component to compensate for rapidly changing variations in the optical system.

29. The method of claim 28 where a rate of changes in the temperature of the fiber optic component is in the range of about 0 to 5 Hz.

30. The method of claim 28 where a rate of changes in the mechanical strain of the fiber optic component is in the range of about 0 to 500 kHz.

31. The method of claim 28 where the fiber optic component is a distributed feedback fiber laser.

32. The method of claim 31 where a length of the distributed feedback fiber laser is optimally chosen to provide a particular mechanical natural frequency and optical linewidth.

33. A method of making a tunable fiber optic component comprising:

a) placing a fiber optic component within a tensioning structure;

b) affixing ends of the fiber optic component to longitudinally opposing ends of the tensioning structure; and

c) placing the tensioning structure within an acoustic damping material.

34. The method of claim 33, further comprising filling an area between the fiber optic component and the tensioning structure with a second acoustic damping material.

35. The method of claim 33, further comprising placing the tensioning structure in thermal contact with a thermally controlled surface wherein the first and second acoustic damping material are also thermally conductive.

36. A method of making a tunable fiber optic component comprising:

a) placing a fiber optic component within an acoustic damping, thermally conductive material;

b) placing the acoustic damping, thermally conductive material in contact with a thermally controlled surface.